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PATENTS

UNITED STATES PATENT APPLICATION

OF

ALEXANDER VASILEVSKY, MORTON TARR AND SERGIO PARISE

FOR

**HOME AREA NETWORK INCLUDING ARRANGEMENT FOR DISTRIBUTING TELEVISION
PROGRAMMING OVER LOCAL CABLE**

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By

Richard A. Jordan

Richard A. Jordan

INCORPORATION BY REFERENCE

U. S. Patent Application Serial No. 09/365,726, filed August 3, 1999, in the name of Richard Edson, entitled "Multi-Service In-Home Network With An Open Interface" and assigned to the assignee of this application, incorporated by reference.

U. S. Provisional Patent Application Serial No. 60/193,813, filed March 31, 2000, in the name of Theodore F. Tabloski, et al., entitled "Home Area Network" and assigned to the assignee of this application, incorporated by reference.

U. S. Patent Application Serial No. 09/649,493, filed August 28, 2000, in the name of Peter A. Kaczowka, entitled "System And Method For Providing Translucent Region Over A Video Program For Display By A Video Display Device" and assigned to the assignee of this application, incorporated by reference.

U. S. Patent Application Serial No. _____, filed on even date herewith in the names of Alexander Vasilevsky, et al., entitled "System And Method For Providing Video Programming Information To Television Receivers Over A Unitary Set Of Frequencies" (Attorney Docket No. UCN-005) and assigned to the assignee of this application, incorporated by reference.

FIELD OF THE INVENTION

The invention relates generally to the field of user-premises or home area networking, to allow different types of systems and/or communications devices to utilize one in-home network to communicate with each other and to access a number of external communication services, and more specifically to systems and methods of providing video programming information from a plurality of sources to television receivers over a unitary set of channels to which the television receivers are adapted to tune.

BACKGROUND OF THE INVENTION

U. S. Patent Application Serial No. 09/365,726, filed August 3, 1999, in the name of Richard Edson, entitled "Multi-Service In-Home Network With An Open Interface" (hereinafter "the Edson application") and U. S. Provisional Patent Application Serial No. 60/193,813, filed March 31, 2000, in the name of Theodore F. Tabloski, et al., entitled "Home Area Network" (hereinafter "the Tabloski, et al., application") describe various embodiments of an in-home network and server therefor that provides a number of services. Generally, one of the services is to distribute video program information to, for example, television receivers for viewing thereon. In one embodiment, the video program information may be provided by one or more of a number of sources, including, for example, over-the-air broadcast, a cable provider or a digital satellite provider, and the server generally distributes the video program information to the television receivers over a cable connection that defines a unitary set of channels to which the television receivers are adapted to tune. It is also desirable to allow the server to also receive video program information from one or more secondary sources, such as a local video source, and integrate that video program information with the video program information from the other source(s), over the same unitary set of channels.

SUMMARY OF THE INVENTION

The invention provides a new and improved system for and method of providing, in connection with a home area network that includes a home server, television programming information to television receivers over a cable connection local to the home containing the home area network.

In brief summary, the invention provides a television program distribution arrangement for use in a connection with a server in a home area network, the television program distribution arrangement being configured to distribute television programming over a local video link. The television program distribution arrangement comprises a television programming information

1 receiver module, a television programming information assembler module, and a control module.
2 The television programming information receiver module is configured to receive television
3 programming information from a plurality of sources. The television programming information
4 assembler module is configured to assemble said television programming information as received
5 by the television programming information receiver module into a unitary set of channels for
6 transmission over the local link. The control module is configured to control the television
7 programming information receiver module and the television programming information assembler
8 module.

9 BRIEF DESCRIPTION OF THE DRAWINGS

10 This invention is pointed out with particularity in the appended claims. The above and
11 further advantages of this invention may be better understood by referring to the following
12 description taken in conjunction with the accompanying drawings, in which:

13 FIG. 1 depicts a home area network including an arrangement for providing television
14 programming information to television receivers over a cable connection local to the home area
15 network; and

16 FIG. 2 depicts a functional block diagram of a portion of a home server that provides
17 television program information providing arrangement useful in the home area network depicted in
18 FIG. 1.

19 DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

20 FIG. 1 depicts a home area network 10 including an arrangement for providing television
21 programming information to television receivers over cable connection that is local to the home area
22 network, constructed in accordance with the invention. Generally, the home area network 10
23 facilitates the connection of a plurality of household appliances, devices, television and radio

1 receivers, telephone sets, and other facilities (generally "devices") 11(1) through 11(N) (generally
2 identified by reference numeral 11(n)) to a home server 12 over one or more digital communication
3 links generally identified by reference numeral 13 and one or more analog communication links
4 generally identified by reference numeral 14. The home server 12 can also connect to a number of
5 external connections, including a central office in the public switched telephony network (PSTN)
6 over a PSTN link 23, a network such as the Internet over a network link 20, a cable connection (for
7 use in providing cable television, telephony, Internet and other services as will be apparent to those
8 skilled in the art) over cable link 22, a compact disk player over a compact disk link 21, a barcode
9 reader over barcode link 24, a local video source 25, and perhaps other devices (such as devices
10 providing information via satellite and the like, home security devices, and so forth) over other links
11 generally identified by reference numeral 26.

12 As described in, for example, the aforementioned Edson and Tabloski, et al, applications, the
13 devices 11(n) can transfer information among themselves over the respective communication link
14 13, 14 to which they are connected. In addition, the devices 11(n) connected to one communication
15 link 13, 14 can transfer information to devices connected to another communication link 13, 14 and
16 between the devices 11(n) and the PSTN, network, cable, etc., through the server 12; in that
17 operation, if one device 11(n') is connected to an analog communication link 14 and another device
18 11(n'') (n''≠n') is connected to a digital communication link 13, the server 12 can perform a digital
19 to analog or analog to digital conversion as necessary. In addition, the server 12 operates to store
20 information received from the PSTN, network, cable, and devices 11(n) for later transmission over
21 the PSTN, network, cable, etc., and later transmission to the devices 11(n). The information
22 transferred over communication links 13 is preferably in digital form, as is the information stored
23 on the server. On the other hand, information may be transferred over other connections in digital
24 or analog form as appropriate.

25 The devices 11(n) that can be connected to the home area network 10 can include a number
26 of types of appliances, including but not limited to devices such as personal computers, personal
27 digital assistant (PDA) devices, telephony devices (illustratively device 11(N)), and home
28 entertainment devices such as radio and television receivers, DVD, compact disk, video and audio

1 tape and record players, and the like. In addition, devices 11(n) that can be connected to the home
2 area network can include lighting, heating and cooling, and similar systems, as well as appliances
3 such as stoves and ovens. If a particular device is a "legacy" device, that is, a device that itself does
4 not have an interface that can be connected to a digital communication link 13, that legacy device
5 can be provided with a suitable interface to allow it to be so connected.

6 Generally, the home area network 10 operates to allow information to be stored on the server
7 12, transferred among the devices 11(n), and transferred from or to a number of external sources or
8 destinations, including, for example, sources or destinations over a network such as the Internet or
9 the public switched telephony network (PSTN), cable or satellite television or radio, music sources
10 such as compact disks. The information may comprise any form of information, including, for
11 example, audio information, image and video information, information in text form, control
12 information for, for example, controlling one device from another or from the server 12 in relation
13 to, for example, occurrence of certain events, computer programs, and so forth. The home area
14 network can be used to, for example, transfer audio information from sources to destinations such
15 as the server 12 for storage or to various devices 11(n) for playing. Similarly, the home area network
16 10 can be used to transfer image or video information from sources to destinations such as the server
17 12 for storage or to various devices 11(n) for display. In addition, the home area network 10 can be
18 used to transfer control information to control controllable devices, such as lighting, appliances such
19 as stoves and ovens, heating and cooling systems, alarm systems and the like.

20 The communication links 13 may be in any form, including a hard link such as a wire, optical
21 fiber or other arrangement for transferring electrical, optical or other signals among the appliances.
22 Alternatively or in addition, communication links 13 may comprise wireless links, such as but not
23 limited to infrared links or links provided by signals in other parts of the electro-magnetic spectrum.
24 Communication links 13 may comprise communication links specially provided for the home area
25 network 10, and/or they may include pre-existing links such as telephone lines, wiring provided for,
26 for example, AC power distribution, and the like.

1 Each device 11(n) connected to a digital communication link 13 preferably includes or is
2 provided with an interface (not separately shown) that enables it to transmit information, in the form
3 of message packets to, and/or receive information in the form of message packets from each other
4 and the home server 12 over the respective communication link 13. When a device 11(n) receives
5 message packets containing information, it can use the information as described below.

6 Generally, the server 12 includes a number of components (not separately shown), including
7 components for processing, storing and retrieving data in digital form, and for converting data
8 between digital and analog form. With particular reference to the instant invention, the home area
9 network 10, and, in particular, server 12, provides an arrangement whereby video program
10 information provided by, for example, a local video source over local video link 25, can be
11 integrated with video program information provided by a cable provider over cable link 22, and
12 distributed to the television receivers over a unitary set of channels. The unitary set of channels will
13 conform to the set of channels over which the cable provider normally provides video program
14 information, and which are tunable by the television receivers to which the server 12 provides the
15 video program information. For example, if the cable provider provides video program over a set
16 of channels arbitrarily numbered 1 through N, the video program information arrangement
17 essentially removes the video program information provided by the cable provider for one channel
18 "n," and substitute for some or all of the channel "n" video program information that is received over
19 the local video link 25 in that channel. Accordingly, the video program information arrangement will
20 provide, to the television receivers connected to the server 12, a composite video signal for channels
21 1 through "n-1" and "n+1" through N as provided by the cable provider, and a substituted video
22 image signal for channel "n" as generated by the server's video program information arrangement.
23 The video program information arrangement described herein does not provide, in the substituted
24 channel, a substitute audio signal for the substituted channel, but a substitute audio signal may be
25 provided using arrangements not described herein.

26 The video program information from the local video link 25 may completely substitute for
27 the video program information from the cable provider in the substituted channel. Alternatively, the
28 video program information from the local video link 25 may substitute for a portion of the video

1 program information from the cable provider, in a window in, for example, a picture-in-picture
2 format, in the channel, with the video program information from the local video link 25 being
3 displayed in a region of the video screen of predetermined size, with the video program information
4 from the cable provider being displayed in the rest of the video screen. As another alternative, the
5 video program information from the cable provider may be displayed in a small region of the video
6 screen, with the video program information from the local video link 25 being displayed in the rest
7 of the video screen. The video program information from the local video link 25 may be any form
8 of video program information, including, for example, information from one or more cameras to
9 facilitate monitoring of areas of the home, such as for security, baby or child monitoring and other
10 operations that will be apparent to those skilled in the art.

11 The home server 12 includes a television information module 40 to provide television
12 program information to the one or more television receivers that are located in, for example, the
13 home that includes the home area network 10. The television program information provided by the
14 television information module 40 may be in digital form, in which case it may be distributed over,
15 for example, one or more of the communication links 13 to devices 11(n). Those of the devices
16 11(n) that are capable of displaying one or both of the video component and/or audio component of
17 the television program information can, under control of a user, receive the information and display
18 and/or play the respective component. Instead or in addition, the television program information
19 provided by the television information module 40 may be in analog form, in which case it may be
20 transmitted over local cable connection 27 to, for example, television receivers (not separately
21 shown), that may be located in the home that includes the home area network 10. As a further
22 alternative, the television program information provided by the television information module may
23 be broadcast as a low-power wireless signal that can be received by a nearby television receiver.

24 The television program information provided by television information module 40 may
25 originate from a number of sources. For example, the television information module 40 may receive
26 television program information, comprising one or both of the video and/or audio components, from
27 a cable provider, satellite connection or the like over the cable link 22. The television information
28 module 40 may also receive television program information over, for example, a network such as

1 the Internet over the network link 20. The television information module 40 may also receive video
2 information, which will include the video component and may also include the audio component of
3 video program information, over local video link 25. The audio information received over the
4 compact disk link 21 may also be provided to the television information module 40, which may use
5 the audio information as the audio component of video program information.

6 The television information module 40 may also receive miscellaneous image information
7 from a number of sources, that it may use as the video component of television program information
8 provided to the television receivers. For example, the miscellaneous image information may be in
9 any convenient image format, such as the well-known JPEG, GIF or bitmap formats, which the
10 television information module 40 can process to convert as necessary to a form in which it can be
11 used as video program information for provision to the television receivers.

12 In addition, the television information module 40 may receive textual information, which
13 it can process to convert to a form in which it can be used as video program information for
14 provision to the television receivers. For example, the textual information may be in the form of
15 Web pages encoded in HTML form, Emails, or other textual information that may be received over,
16 for example, network link 20. The textual information may also be in the form of digital books
17 which may be received over the network link 20, compact disk link 21, or other links 26. Textual
18 information may also be generated by the server 12 itself, and may include, for example,
19 notifications regarding changes of status of security alarm systems, notifications of incoming
20 telephone calls and notifications of other occurrences as will be apparent to those skilled in the art.

21 The television information module 40 may also receive other forms of information which it
22 may use as video programming information to be provided to the television receivers, as will be
23 apparent to those skilled in the art.

24 Generally, if the television program information provided by the television information
25 module 40 corresponds to, for example, the television program information received from the cable
26 link 22, which comprises television program information for a plurality of channels, which may be
27 arbitrarily identified by channels 1 through N (where "N" is an integer; generally channel "n"), the

1 television information module 40 may substitute television program information from another source
2 for some or all of the television program information for a selected channel n' prior to providing the
3 television program information to the television receivers. Substituted television program
4 information can be such as to substitute for the entire television program information, or the entire
5 video or audio component thereof, in the selected channel n'. In that case, if, for example, the
6 substituted television program information is to substitute for the video component of the television
7 program information in the selected channel n', the television information module 40 can delete the
8 video component in channel n' as received from the cable link 22 and insert the substituted television
9 program information in channel n' before providing television program information to the television
10 receivers.

11 Similarly, if the substituted television program information is to substitute for the audio
12 component of the television program information in the selected channel n', the television
13 information module 40 can delete the audio component in channel n' as received from the cable link
14 22 and insert the substituted television program information in channel n' before providing the
15 television program information to the television receivers. On the other hand, if the substituted
16 television program information substitutes for only a portion of the television program information
17 received over the cable link 22 in that channel n', the substituted television program information may
18 be substituted in such a way as to be shown in a window in the television program, such as to display
19 it as a "picture in a picture." In any case, the television information module 40 can scale the
20 substituted television program information as necessary to fit either the window, if the substituted
21 television program information is to substitute for a portion of the television program information
22 in the channel n' as received over the cable link 22, or to fit the screens of the television receivers
23 to which the television information module 40 provides the television program information.

24 In addition to receiving television program information and providing it to the television
25 receivers, the television information module 40 can store television program information for later
26 retrieval, as, for example, a video recorder.

1 With this background, a functional block diagram of the one embodiment of television
2 information module 40 is depicted in FIG. 2. With reference to FIG. 2, the television information
3 module 40 includes a plurality of elements, including a television program information receiver
4 module 41, a television program information buffer store 42, two video effects modules including
5 a substitute television program information control module 43 a translucent video image control
6 module 44, a television program recording control module 45, and a television program information
7 assembler module 47, all under control of a control module 47. The television program information
8 receiver module 41 receives the television program information from the various sources, as
9 described above, and provides them to other modules. In addition, the television program
10 information receiver module 41 may convert either or both of the video component or audio
11 component of the television program information to digital form for storage in the television
12 program information buffer store 42. The television program information stored in the buffer store
13 42 may be processed by the other modules immediately or shortly after being stored therein, as will
14 be described below. Alternatively, or in addition, the television program information stored in the
15 buffer store 42 may remain in the buffer store 42 for later retrieval, as in, for example, a video
16 recorder. The television program information receiver module 41 may store television program
17 information from, for example, all of the channels that are received over the cable link 21 in the
18 television program information buffer store 42, or one or more selected channels. In one
19 embodiment, the television program information buffer store 42 is in the form of a frame buffer.

20 The video effects modules operate to process television program information received from
21 the cable link 22 and buffered in the television program information buffer store 42 to provide
22 selected video effects. The substitute television program information control module 43 operates
23 to substitute television program information for television program information received over the
24 cable link 22 in one or more of the respective channels. An illustrative circuit for substitute
25 television program information control module 43 is described in U. S. Patent Application Serial No.
26 _____, filed on even date herewith (Attorney's docket no. UCN-005) in the names of
27 Alexander Vasilevsky, et al., entitled "System And Method For Providing Video Programming
28 Information To Television Receivers Over A Unitary Set Of Frequencies," assigned to the assignee

1 of the present invention and incorporated herein by reference. The substitute television program
2 information control module 43, under control of the control module 46, operates to substitute one
3 or both of the video and audio component of the television program information in one or more of
4 the channels n', n'',... television program information for which has been received over the cable link
5 22 and stored in the buffer store 42. The substitute television program information control module
6 43 can receive substitute television program information from the television program information
7 receiver module 41 and substitute it in the buffer store 42 for some or all of the television program
8 information received from the cable link 22 for respective channel(s) n', n'',... as described in the
9 aforementioned patent application.

10 The control module 47 can provide control information to the substitute television program
11 information control module 43. The control information can identify, for example, the channel or
12 channels in which substitute television program information is to be provided, and, for each such
13 channel, the source from which the substitute television program information is to be obtained. In
14 addition, if, for a particular channel n', n'', the substitute television program information is to be
15 substituted for a portion of the television program information in the channel as received from the
16 cable link 22, the control information provided by the control module can indicate the location and
17 size of the window in which the substitute television program information is to be displayed. The
18 substitute television program information control module 43 can use the location information to
19 control particular locations in the buffer store 42 in which it (that is, the substitute television
20 program information control module 43) will store substitute television program information. In
21 addition, substitute television program information control module 43 can use the size information
22 to scale the substitute television program information as necessary so that the substitute television
23 program information will fit into the window. The video pipeline information 43 can also use the
24 size and location information to disable the television program information receiver module 41 from
25 storing television program information received from the cable link 22 for the respective channel in
26 the storage locations in the buffer store 42 in which substitute television program information is to
27 be stored.

1 The control module 47 may receive information from, for example, a viewer viewing the
2 channel on a television receiver, in which case the viewer can control source of substitute television
3 program information, the channel in which the substitute television program information is to be
4 provided, whether the substitute television program information is to be substituted for all of the
5 television program information as received from the cable link 22, and, if not, the size and location
6 of the window in which the substitute television program information is to be displayed. In addition,
7 the information provided by the viewer may include the identification of the channel or channels in
8 which substitute television program information is to be provided. Furthermore, the information
9 provided by the viewer may include the particular source of substitute television program
10 information that is to be displayed in a particular channel, in which case different channels can
11 display substitute television program information from different sources. It will be appreciated that,
12 in absence of information from the viewer for controlling any particular aspect, the control module
13 47 may instead make use of default information. In addition, for some types of information, such
14 as information relating to change in status of a home security system, notifications regarding
15 incoming telephone calls, and the like, the substitute television program information control module
16 43 can enable those types of information to be displayed in all of the channels.

17 The translucent video image control module 44 operates to provide a translucent region in
18 the video component of the television program information stored in the buffer store 42. An
19 illustrative circuit for substitute television program information control module 43 is described in
20 U. S. Patent Application Serial No. 09/649,493, filed August 28, 2000, in the name of Peter A.
21 Kaczowka entitled "System And Method For Providing Translucent Region Over A Video Program
22 For Display By A Video Display Device," assigned to the assignee of the present invention and
23 incorporated herein by reference. As described in that application, the translucent video image
24 control module 44 provides a translucent region that partially obscures the video image from, for
25 example, the cable link 22 for a particular channel. The substitute television program information
26 control module 43 can, for example, insert an image from another source into the translucent region.
27 The translucent region surrounding the image inserted by the substitute television program
28 information control module 43 can serve to provide enhanced contrast between the video image from

1 the cable link 22 and the image inserted by the substitute television program information control
2 module 43, so that the image inserted by the substitute television program information control
3 module 43 may be more easily viewed. As with the substitute television program information
4 control module 43, the translucent video image control module 44 operates under control of control
5 information provided by the control module 47.

6 It will be appreciated that the television information module 40 may include video effects
7 modules other than or in addition to the substitute program information control module 43 and
8 translucent video image control module 44. For example, the television information module 40 may
9 provide video effects modules that can process television program information buffered in the buffer
10 store 42 to change colors, to introduce visual artifacts such as moire patterns, and other effects that
11 will be apparent to those skilled in the art.

12 The television program recording control module 45 controls storage of television program
13 information associated with one or more channels provided thereto by the television program
14 information receiver module 41 in a buffer store for later retrieval. The television program recording
15 module 45 effectively enables the server 12 to operate as a video recorder. As with the video effects
16 modules, the television program recording control module 45 operates under control of control
17 information provided thereto by the control module 47, which, in turn, may comprise default control
18 information and/or control information based on information provided by a viewer. The
19 information provided by a viewer may include information as to the day, time period and channel(s)
20 for which television program information is to be recorded. Alternatively, the information provided
21 by a viewer for a particular program may include information as to the program, by name or other
22 identifier, and the television program recording control module 45 may itself determine the day, time
23 period and channel during which television program information for that program will be provided.
24 In either case, the television program recording control module 45 can provide the television
25 program information for the channel(s) to be recorded to a video store 48 for storage. The video
26 store may comprise any arrangement for recording information in analog and/or digital form,
27 including, for example, magnetic tape, or digital form, including, for example, magnetic disks. If
28 the television program information to be recorded is provided to the television program recording

1 control module 45 in digital form, and the television program information is to be recorded in analog
2 form, the television program recording control module 45 can convert the television program
3 information as received from the television program information receiver module 41 to analog form.
4 Similarly, if the television program information to be recorded is provided to the television program
5 recording control module 45 in analog form, and the television program information is to be
6 recorded in digital form, the television program recording control module 45 can convert the
7 television program information as received from the television program information receiver module
8 41 to digital form.

9 As noted above, the television program recording control module 45 can also retrieve
10 previously-recorded television program information to be provided to the television receivers that
11 are connected to the server 12 for viewing. In that operation, the television program recording
12 control module 45 can retrieve the previously-recorded television program information from the
13 video store and, for example, provide it to, for example, the substitute television program
14 information control module 43, which, in turn, can substitute the television program information
15 from the television program recording control module 45 in a selected channel, as described above,
16 for subsequent transmission to the television receivers connected to the server 12. If the previously-
17 recorded television program information was recorded in analog form, the television program
18 recording control module 45 can convert it to digital form before providing it to the substitute
19 television program information control module 43. The television program recording control
20 module 45 also retrieves previously-recorded television program information in response to control
21 information provided thereto by the control module 47.

22 The television information module 40 can include modules for performing other services as
23 will be appreciated by those skilled in the art.

24 The television program information assembler module 46, under control of the control
25 module 47, receives television program information from a number of sources, including the
26 television program information receiver module 41, the television program information buffer store
27 42, the substitute television program information control module 43, and the television program

1 receiver control module 45, and other modules (if any) as necessary and generates a signal in the
2 unitary set of channels for transmission to the television receivers connected to the server 12.

3 The invention provides a number of advantages. In particular, the invention provides an
4 arrangement for providing a home area network that includes a television information module that
5 can distribute television program information received from one or more sources to television
6 receivers connected thereto in a home in a unitary set of channels. The television information
7 module can also provide a number of services, including merging television program information
8 from a number of sources into the unitary set of channels, substituting television program
9 information from one channel for some or all of television program information as necessary in a
10 channel received from another source. The television information module can also record television
11 program information as received from a source for later retrieval and viewing.

12 It will be appreciated that a system in accordance with the invention can be constructed in
13 whole or in part from special purpose hardware or a general purpose computer system, or any
14 combination thereof, any portion of which may be controlled by a suitable program. Any program
15 may in whole or in part comprise part of or be stored on the system in a conventional manner, or it
16 may in whole or in part be provided in to the system over a network or other mechanism for
17 transferring information in a conventional manner. In addition, it will be appreciated that the system
18 may be operated and/or otherwise controlled by means of information provided by an operator using
19 operator input elements (not shown) which may be connected directly to the system or which may
20 transfer the information to the system over a network or other mechanism for transferring
21 information in a conventional manner.

22 The foregoing description has been limited to a specific embodiment of this invention. It will
23 be apparent, however, that various variations and modifications may be made to the invention, with
24 the attainment of some or all of the advantages of the invention. It is the object of the appended
25 claims to cover these and such other variations and modifications as come within the true spirit and
26 scope of the invention.

27 What is claimed as new and desired to be secured by Letters Patent of the United States is: